

MODEL PROJECT INFORMATION SHEET

UPGRADING NUCLEAR MEDICINE PRACTICES

REGIONAL LATIN AMERICA - RLA/6/027 (ARCAL XXIII)

SUMMARY

There are more than 200 old analogue gamma cameras in Latin America, some of which were obtained second hand. Most of them are not uniform in performance because they are not equipped with computers and the relevant software. Consequently, there is a lack of standardization in clinical protocols and in the presentation and interpretation of results from clinical studies, which adversely affect patient treatment. This model project will establish an upgrading programme for the old analogue cameras in the region. The upgrade is based on a system developed by the Agency which will prolong the service life and improve the image quality of the cameras and will also make it possible to use the cameras for dynamic studies. The project will transfer the technology required to create regional and national capabilities to implement the programme, to undertake future development and assure the sustainability of the programme. The Agency system is cost-effective compared to commercially available upgrades, and will increase the effectiveness and quality of nuclear medicine services in the region. Given the widespread use of gamma cameras in medical practice, the project will have a significant socioeconomic impact.

Project duration: 4 years. Total budget: US \$527,500.

INTRODUCTION

According to a recent survey, at the end of 1993 approximately 650 gamma cameras were in use in 400 or so nuclear medicine centres in Latin America. These cameras have a very important role in medical diagnostic studies. About 200 of them are of the analogue type. Unfortunately, most of them are either more than 10 years old or are second-hand cameras which have been massively exported from the USA during the last decade. The number of these second-hand cameras is expected to increase rapidly in the future. Analogue gamma cameras are not usually equipped with computers, although

some are interfaced with obsolete computers, such as the bulky PDP-11 mini-computer which is no longer supplied by the industry with hardware and software updates. Similar cameras have been phased out in most developed countries. A Chief Scientific Investigator of a related Co-ordinated Research Programme (CRP) has reported that two thirds of the second-hand cameras in Latin America have very poor performance. There is a lack of necessary upgrades, standardization of clinical protocols and presentation and interpretation of results, all of which adversely affect the quality of treatment to patients.

Commercial upgrades for old analogue gamma cameras are available at a cost of US \$40,000-\$60,000, but most nuclear medicine centres in the region cannot afford them. In view of the economic difficulties in many Latin American countries, a technically sound but less expensive solution to the problem of obsolete gamma cameras is required if the practice of nuclear medicine in the region is to be standardized and further developed.

To address this need, the Agency convened a Consultants Meeting on upgrading analogue gamma cameras in April 1992. The participants thoroughly reviewed new developments in personal computer applications for this purpose, and concluded that the addition of an appropriate PC type computer and appropriate software would facilitate image acquisition, data storage, and the processing and display of clinical studies. Cameras modified in this way would also be capable of dynamic studies. Design criteria for an appropriate system were defined, and the hardware upgrades required for some of the older cameras were identified. After consideration of matters relating to standardization of the system, software validation, new algorithms and new hardware platforms, the participants recommended the use of an IBM 386 or 486 type PC and further development of the Agency's prototype software system. This recommendation was accepted, and an interfacing card and software system has been developed through service contracts. Initial trials resulted in the restoration of a 15-year-old camera to a condition such that it should be useful for 5 to 10 more years. The new system is powerful, user friendly, much cheaper than commercially available systems, and will enable all upgraded systems in the region to be standardized.

The use of the Agency's PC-based gamma camera upgrade system in Latin America is timely and responds to a major need in the region. It is essential to increase the effectiveness of the gamma cameras now in use and thus to improve nuclear medicine practice at an affordable price.

THE AGENCY TECHNOLOGY

The Agency's IBM PC-based upgrading system for old analogue gamma cameras is a state-of-the-art development. It integrates advanced correction circuits, gamma camera interfacing to computers, new algorithms and imaging processing techniques. With this system many old analogue gamma cameras will produce better quality imaging, obtain dynamic study functions for brain, heart and kidney, etc., have prolonged service life and avoid troublesome maintenance of equipment. This technology will be further strengthened by activities under a CRP in 1995. The Agency's technique of upgrading old gamma cameras is cost-effective. The interfacing cards and the software system will

cost approximately US \$4000. Users will purchase their own PC and a printer, while the Agency will provide the interfacing card and relevant software. The total cost of the upgrade system and hardware will be about US \$7000 per gamma camera, thus saving about US \$40,000 per camera.

OBJECTIVES

1. To increase the utility of existing nuclear medicine equipment in Latin America by upgrading all analogue gamma cameras.
2. To transfer technology and expertise in computer interfacing and know-how in modern correction circuits, software and validation related to programming for nuclear medicine studies through training teams of medical physicists and computer engineers in recipient institutes.
3. To undertake the first attempt to bring about a degree of standardization of clinical studies by establishing standard protocols including presentation of results.
4. To strengthen regional co-operation and networking in gamma camera upgrading and standardization of clinical studies and protocols.

PROJECT IMPLEMENTATION AND MONITORING

The approach to implementation of the programme will be gradual. Initial efforts will be concentrated on upgrading approximately 50 gamma cameras in major public nuclear medicine centres. These upgradings will be used for demonstrations and to encourage other centres to undertake similar activities. It is foreseen that every participating nuclear medicine centre will have upgraded its analogue gamma camera by the end of the project. Required technology transfer and training of national teams in recipient institutions will be undertaken through regional workshops, national training courses and expert services as well as through regional networking. The national teams in large countries will be composed of medical physicists from nuclear medicine centres who will test and demonstrate the upgraded systems, and nuclear electronics engineers from nuclear energy commissions who will assemble and install the upgraded systems. In small countries, the teams will consist only of medical physicists. Electronics engineers from larger countries will assemble and install the upgraded systems in smaller countries, with the assistance of Agency experts, if necessary.

Implementation will extend over four years. The activities in 1995 will include: identification of the national counterparts and national co-ordinators, and establishment of project teams in each participating country; nationwide surveys of nuclear medicine centres in participating countries to obtain exact information about the location and status of the gamma cameras that need upgrading; and a project co-ordination planning meeting.

The co-ordination planning meeting will investigate the status of gamma cameras in each participating country, study the requirements for the project and identify problems, demonstrate the Agency's upgrading system and its effective use, and make detailed plans for project implementation.

An Agency CRP on Validation of Interfacing with Gamma Cameras and Appropriate Applications of the Software for Data Processing of Clinical Studies will start in 1995. Investigators from participating institutions will be trained to modify and update the software provided by the Agency. This CRP will support further model project activities.

In 1996 a regional workshop on upgrading analogue gamma cameras with standard PCs and relevant software will be organized, and expert services, equipment and supplies (interfacing devices) will be provided. In 1997 two national training courses on installation, correct operation and maintenance of computer interfaces and software will be undertaken. Expert services and equipment supplies (interfacing devices) will also be provided in 1997 and 1998.

Monitoring progress of the project will be undertaken through project co-ordination meetings. An annual progress report will be prepared by each national project co-ordinator showing the degree of implementation, the achievements and problems, and the actions needed for further progress. The reports will be presented and discussed in the co-ordination meetings. Upon completion of the project, a seminar will be held at an appropriate venue for final evaluation of the project activities, including discussions of the main achievements and an assessment of the socioeconomic impact of the project and its impact on human health. A model project final report will be prepared by the Agency on the basis of the seminar papers.

Follow-up activities by the Agency and regional authorities will be required to monitor further regional and national activities in extending upgrading activities to other old gamma cameras in the region.

REGIONAL AND NATIONAL COMMITMENT

The recipient institutes, about 40 public nuclear medicine centres, that will participate in the project will provide PCs and suitable printers (each costing about US \$3000) required for the upgrade. The nuclear medicine centres and the nuclear energy commissions will provide the medical physicists and electronics engineers to be trained. As a result of the expected success of the programme, it is expected that private nuclear medicine centres with analogue gamma cameras or gamma cameras with old computer systems will elect to use the Agency's system to upgrade their equipment at their own cost. Each interested end user will be required to provide real proof of the state of the gamma camera to be upgraded. The interface will be given only for gamma cameras that can profit from a PC connection. Regional and national networks will be maintained to encourage the exchange of experience, support further co-operative programmes, and to follow up the upgrading activities for the remaining gamma cameras.

THE AGENCY'S INPUT

The Agency's IBM PC-based upgrading system which will be offered to participating Member States, and the technology transfer programme associated with implementation and further development of the system, are the backbone of this model project. The CRP starting in 1995 will further strengthen this technology and its utilization.

The technology transfer will be undertaken through regional workshops, national training courses and expert services. Two one-week regional workshops for about 30 staff members from nuclear medicine centres will address technology transfer in PC interfacing, modern correction circuits, software programming and validation. National training courses will be organized for more end users in some countries which have more analogue gamma cameras and other nuclear medicine equipment to be upgraded. The training courses will emphasize computer interfacing, full utilization of clinical software, modification and change of the programme for local needs, relevant services and maintenance. Expert services will be provided. In some circumstances, spare parts could be supplied under the project for necessary tuning or repairs.

IMPACT

The short term impact of the project will be the upgrading and increased utility of approximately 50 old gamma cameras in the region, which will increase the effectiveness of nuclear medicine services to the public. Use of the Agency's upgrade system and software rather than commercially available upgrades will result in a saving of at least US \$40,000 for each camera. The total saving achieved by the project is thus approximately US \$2 million. Further, the resulting increase in the useful life of the upgraded cameras will make it unnecessary to purchase new equipment. At a cost of US \$100,000 per refurbished unit, this would represent an additional saving of approximately US \$5 million for the region. Timely group training of teams of medical physicists and computer engineers to be capable of installing the hardware and software and carrying out the necessary adaptations and updating, at both the national and the regional level, is essential for the upgrading programme and its sustainability. This capability would constitute a strong base for a long range upgrading programme, without Agency assistance, for about 150 more analogue gamma cameras in the public and private sectors as well as others that will need to be improved in the future. The most significant social impact of the standardization of clinical studies and the establishment of standard protocols would be the increased effectiveness and quality of nuclear medicine services to patients and the benefit to human health. The long range financial savings that could result from the small investment in this project would amount to about US \$20 million in hardware alone. The cost-benefit analysis of this project is clear and is due to the use of Agency cost-effective technology and technology transfer. The end user institutions would benefit from the outset and tangible benefits would be passed on to the ultimate end users, the patients.

FINANCES

The budget allocation for the project is US \$527,500, distributed as follows:

Year	Experts		Equipment	Fellowships		Scientific Visits		Grp. Trg.	Sub-Cont.	Misc Comp	Total
	M/D	US \$	US \$	M/D	US \$	M/D	US \$	US \$	US \$	US \$	US \$
1995	3/15	39,900	85,000	-	-	-	-	-	-	-	124,900
1996	2/0	24,000	85,000	-	-	-	-	40,000	-	-	149,000
1997	4/0	50,400	50,000	-	-	-	-	40,000	-	-	140,400
1998	1/0	13,200	40,000	-	-	-	-	60,000	-	-	113,200
TOTAL	10/15	127,500	260,000	-	-	-	-	140,000	-	-	527,500

Source of funding: TACF